

By Melissa Lubitz

Regulations & UV Technology



The Ontario drinking water arena defines various categories of drinking water systems, which can be described as large municipal systems, smaller waterworks as well as private residential drinking water facilities that serve a specific number of residences. Because of the new Ontario drinking water regulations, more treatment opportunities are being presented for the smaller waterworks of Ontario.

Smaller waterworks turn to UV to comply with regulations

The Ontario regulation 170/03 was released in spring 2003 under the Safe Drinking Water Act, outlining the new rules for drinking water facilities across the province of Ontario. This regulation was created not only to update the drinking water regulations but also to ensure that the Walkerton tragedy could not repeat itself.

Improving Smaller Waterworks

It was announced in February 2005 that the township of Ashfield-Colborne-Wawanosh would be given funding for an improved water infrastructure. The township is located in the northwest corner of the county of Huron, known as Ontario's west coast, and edges Lake Huron. This rural community extends from Goderich all the way to Amberley with a population of approximately 5,409 residents.

The funding was a benefit through an increased investment under the Canada-Ontario Infrastructure Program with the governments of Canada and Ontario to contribute up to \$492,314. The township plans were to upgrade three of the local water systems, one of those being the Century Heights Well Supply.

The main objective of the funding was to bring each of the three water systems into compliance with the Ontario Drinking Water Systems Regulation as well as ensure the safety of the water for the township of Ashfield-Colborne-Wawanosh.

The Century Heights water treatment plant is fed by a groundwater source and has utilized chlorine as its primary disinfectant for some time. However, after several years of monitoring, particle counting and discussions with the Ministry of the Environment, it could not be proven that the well supply system was not groundwater under the direct influence (GUDI) of surface water.

As soon as a water supply is deemed GUDI, consideration must be taken for the possibility of the presence of both *Cryptosporidium* and *Giardia*. The consulting engineer on the project, BM Ross & Associates, advised that ultraviolet (UV) disinfection should be implemented into the Century Heights disinfection process in order to accommodate the requirements under GUDI

applications in Ontario. A specification was then generated for the filtration and UV disinfection systems for the Century Heights Well Supply by BM Ross & Associates.

UV in Century Heights

The Century Heights Well Supply specification outlined that the UV equipment must meet the Ontario drinking water requirements 170/03. The proposed system had to ensure at least a 2-log inactivation of *Giardia lamblia* throughout the life of the lamp. The specification also outlined that the UV system must consist of at least two reactor trains. One of the reactor trains had to meet the demand of the water system with the second train to accommodate the full flow in case of an emergency shutdown or required maintenance.

Each of the trains were required to connect to all specified monitors and alarms for safety reasons. The full water treatment plant had to consist of filtration, UV disinfection and residual chlorine. The UV system was required to be the last treatment step prior to release to the distribution network and chlorination to a minimum free chlorine residual of 0.5 mg/L.

The following design characteristics of the UV disinfection system had to be met for the Century Heights well supply:

Design Criteria

Peak Flow	8.6 L/s
Water Temperature	10°C
Water Temperature Range	5°C to 30°C
UV Transmittance @ 253.7 nm	93% (minimum)
Iron Content	0.1 mg/L
Manganese	<0.005 mg/L
Hardness (CaCO ₃)	210 mg/L
Turbidity	0.5 NTU
pH	7.0 to 8.2
Nitrite	0.014 mg/L
Nitrate	<0.05 mg/L



and normal operation.

The majority of drinking water facilities across Ontario, like the Century Heights Well Supply, have operated for many years with no harmful incidences to the public to which they supply drinking water. But regardless of a drinking water plant's past performance and high grades for safe drinking water, many of these facilities are being forced to undergo upgrades

due to the Ontario's regulation 170/03.

Century Heights is just one of thousands of smaller waterworks that will be required to comply with regulation 170/03 in the next year, and the treatment opportunities seem endless. *wqp*

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The performance requirements for the UV disinfection equipment outlined in the specification included proof of performance or validation with the UV system demonstrating a dose of 40 mJ/cm² at the operating flow rate. The UV validation required third-party verification following one of the three approved validation protocols: DVGW W294, O-Norm M5873 or the U.S. Environmental Protection Agency (EPA) UV Disinfection Guidance Manual (DGM).

The UV equipment chosen by BM Ross for the Century Heights Well Supply was the Sterilight SUVAM-6C/4. This UV model met all the outlined design criteria in the specification holding a validation certification according to the EPA UV DGM validation protocol.

The SUVAM-6C/4 UV system is equipped with six low-pressure high-output amalgam-based lamps, each with a 12,000-hour life, and has a reactor with 4-in. flanges. The system is controlled by a PLC control logic, which manages all aspects of the UV system including monitoring lamp status, UV output and all major and minor alarms. The disinfection equipment is configured so that the single PLC panel controls two reactors with normal operation being alternated with each reactor for duty.

The UV equipment was installed at the Century Heights plant in May 2008 by Elgin Construction, with commissioning occurring during the first week of June.

The plant setup has a 5-micron filter preceding each reactor and chlorination injection downstream of the UV systems. The chlorine is injected in order to ensure disinfection continues throughout the distribution system because UV disinfection does not have a residual.

The chlorine concentration is quite small (0.5 mg/L) as that is all that is required for a residual disinfectant. An operator is onsite at least once a day to check on alarm status

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